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ABSTRACT

The use of a schema analysis, or hierarchical classification system, to identify problem-solving approaches among principals with different levels of experience is examined in this paper. Forty-one students in Ontario--10 undergraduate teacher preparation students, 8 teachers with principal qualifications, and 23 principals grouped according to 3 levels of job experience--participated in a fact-finding exercise, thinking-aloud session, and discussion of a case study. Findings demonstrate the existence of interpretable differences between inexperienced and experienced principals. Higher scorers recognized the link between the case study and school climate issues. Both high and low scorers shared several features: a reflection of experience; reliance on outside resource people; search for further data; and awareness of the importance of promoting staff self-esteem. Conclusions are that the schema analysis is useful for the systematic dissection of complex cases and is applicable to broader problem-solving areas and studies with larger sample sizes. Appendices contain the case study, analytic schema, and four tables. (6 references) (LMI)

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An Analysis of School Administration Using Schema Theory[1]

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Introduction and Data Collection

This paper, part of a symposium "Perspectives on Principals' Problem Solving", presents an analysis of the responses of 41 subjects to a case study, "Miss McDonald". The subjects include ten students in undergraduate teacher preparation, eight practising teachers who have achieved the qualifications to become a principal (by Ontario law), eight principals in their first or second year of the principalship, seven with 10 to 15 years, and eight with more than 20 years. These groups are known as Entrants, Aspirants, Rookies, Seasoned, and Veterans respectively. (Avoidance of the terms expert and novice is deliberate.) The nature and origins of the sample studied are detailed in the introductory paper bearing the symposium title.

The case study itself is included as Appendix A to this report. Briefly, it describes a situation involving conflict between a school staff and the school librarian. The situation involves elements of supervision, curriculum, policy, interpersonal relations, physical plant, budget and supply, and staff attitudes. The central character is the librarian, Miss McDonald, and there is one other named protagonist, Miss Green. The situation was presented to each subject for solution in the role of a principal new to the school.

Most of the subjects (the exceptions were the Entrants) were brought together in sets of four for a day, and asked to produce data in various forms as described in the rest of the symposium. Each day began with a warm-up and discussion, and then each research team member took one subject for individual data collection. These individual sessions began with a fact-finding exercise in which subjects were told they would be presented shortly with a case study, and were invited to ask questions concerning the school environment in which the case would be set. This exercise was followed with training in the think aloud

process using suggestions from Ericsson and Simon (1984), and finally subjects went on to the case study. Here, subjects were first asked to read the case aloud, interjecting their thoughts as they read. Then, they were asked to think aloud about how they would solve the problem. Finally, they were asked to recall their thought processes. The degree of separation between reading and solving varied across subjects, as did the degree of thoroughness with which the final recall was treated. The case analysis took between 45 and 100 minutes for each subject. Procedures for the Entrants differed in that they were dealt with individually rather than in groups of four, and they did only the fact finding and case study aspects of the data collection.

Data were actually collected from eight subjects in each of the four more experienced groups. However, three transcripts were lost, but in two cases, this was discovered in time for the subject and interviewer to attempt a joint reconstruction of the case solution. Thus, we report data from 41 subjects, 10, 8, 8, 7, and 8 respectively, from the five experience levels.

Analysis

The essence of the procedure used to analyze the data is to build a collective story-line, across subjects, capturing the variety of responses to the problem, including values exhibited, perspectives taken, and actions planned. Within this collective framework, then, individual responses to the problem can be highlighted and compared. An earlier version of this collective story-line or schema was initially reported in Nagy (1990). That analysis showed that organization of the category system can facilitate its use. Many decisions on categorizing statements into the seven major content areas were difficult, but problems were minimized by organizing the categories from more global (the

problem solving process) to more specific areas (the librarian). It was a more precise and less taxing task to postpone categorization only when a statement clearly fit a narrower category than to postpone when the statement only fit a broader category.

A limitation to the analysis was found, however. Segmentation of the protocol into units for analysis, determination of when one thought unit ends and another begins, depends on striking a balance between capturing detail and producing a manageable category system. It turned out that the category system became unwieldy before all data elements in a single category were sufficiently homogeneous to distinguish levels of experience and expertise in the data set. Because of this difficulty, an additional analysis was developed. This system, modelled on Biggs and Collis (1982), uses a 4-point scale to rate the amount of information dealt with by each subject within the statements assigned to each schema category:

1: makes one or two points without supporting argument or elaboration

2: makes one or two points with supporting argument or elaboration

3: makes two points and relates them to each other with supporting argument or elaboration

4: makes more than two points and relates them to each other with supporting argument or elaboration.

The interpretation of these definitions evolved during analysis. It was not always clear whether the rating scale addressed quality or quantity. There were times when the quality of what was said was not captured by the system, and other times when unadorned quantity (i.e., number of ideas) was misleading, particularly if the subject simply listed several unrelated points. In practice the counting of "points" from the above definitions sometimes took second place

to the following retrospectively reconstructed implicit definitions:

1: just mentioned in passing

2: making a routine point or observation

3: synthesizing several ideas with evidence of thought

4: marshalling a major argument or rationale.

Analysis of the responses to the case involved the following steps: first, segmentation of protocols into thought units or statements; second, categorization of these statements into the categories of the schema; third, rating, on the four-point scale, of the statements made by each respondent in each category. In this last step, each subject may have made several comments, separated in the original transcript, which were placed in the same category. All these statements were collectively given one rating on the four point scale, and are hereafter referred to as one "statement".

Segmentation of the protocols into thought units was done initially by the principal investigator. All other analysis was performed by two assistants. They began with the categorization task, each analyzing the same part of the data independently. Then they met to compare analyses, modify definitions, and resolve disagreements. When the categorization was done, the ratings proceeded in like manner. During each step, the assistants made corrections to decisions made earlier. Quite satisfactory reliability levels were achieved. Only four of the initial 1860 segmentations were changed on reexamination. Agreement on the categorization, before discussion to resolve disagreement, was 85.6%. Agreement on the ratings, again before discussion, was 91.2%.

After the statements were categorized and rated, analysis proceeded by tabulation and analysis of variance, examining first differences across experience, and second differences across expertise, based on ratings by a panel

of experts in the field. These analyses are not entirely straightforward for two reasons. First, on average slightly fewer than one-half of the 41 subjects said anything in and received a rating for each category. Thus, more than one-half the data in a subjects-by-categories matrix are "0". To justify the analysis of variance, these "0" ratings must be considered as missing data rather "failure to score". Otherwise, the data are badly skewed and the ANOVA is not appropriate. Second, controlling the Type I error rate when performing pair-wise comparisons involving five experience groups and all categories of the detailed schema requires some discussion. A 10% Type I error probability was achieved using the Dunn multiple comparison method (Marascuilo and Serlin, 1988). Categories with too few non-zero entries and degrees of freedom to yield a viable test, about one-third of the categories, were eliminated. Then a two-tailed alpha for each separate comparison of 0.0000793 gave the required overall 0.10 level. Degrees of freedom varied, of course, with the number of subjects who had non-zero ratings for each category.

Results

The Collective Schema

The detailed schema contains 92 categories grouped under seven major topics. It is included in this report as Appendix B. The following narrative has been produced from the detailed classification of statements made by all subjects. It is of necessity limited in detail compared to the original transcripts of all subjects. As well, the order in which different individuals dealt with issues is lost. However, the narrative line conveys better than the tabular results an overall flavour of the collective approach of the respondents. It is best thought of as a companion description to set the more detailed results

in context. It serves further to avoid tedious repetition in the sections following, repetition which would otherwise be needed to continually set context for the reader. The bracketed numbers come from the detailed category system reported in Appendix B.

Most subjects spent some time talking about the problem at the most global level (1). They chose to speak about the "true nature" of the problem (1.1), and often about their own problem solving processes and preferences (1.2). Some felt that it was a symptom of underlying issues such as morale (1.1.1), others that it was several problems (1.1.4), and still others that it was a straightforward and localized issue (1.1.5). Some felt that more data were needed to determine if there really was a question to be addressed (1.1.2), while others felt either that something needed to be done, or that the wrong action could make things worse (1.1.3). Those who spoke of the problem solving process talked generally of how they planned for action (1.2.1), of the role past experiences play in their problem solving (1.2.2), of the importance of information and how to get it (1.2.3), or of the development of action plans and/or subproblem identification (1.2.4). Some spoke of developing staff ownership of problems as a basic strategy (1.2.5).

A few respondents related the problem to the wider community (2) and school system (3). Some expressed a lack of information about the community (2.3), while others thought that community or student input to the library operation would be desirable (2.1). Some traced the library problems to a deterioration in community morale (2.2). In the context of the school district, a couple of subjects asked about board policy (3.1), and a similar number talked of consulting with their colleagues (3.2). Most of the references to the school system, however, were calls for support staff assistance (3.3).

About half the respondents made some reference to the wider school context of the problem (4). These responses were of four kinds, concerning school goals (4.1), school atmosphere (4.2), the timetable (4.3), and the role of the vice-principal (4.4).

All of the subjects dealt with the remaining three categories of the schema, the library (5), personnel (6), and the librarian herself, Miss McDonald (7). The statements concerning the library fell into three categories, defining the role of the library (5.1), discussing present practice (5.2), and improving the library operation (5.3). Those dealing with the role of the library talked about how they felt about letting the librarian run her "own show" (5.1.1), provincial policy (5.1.2), finding out what the staff expected of a library (5.1.3), and of their own expectations (5.1.4). Those who discussed present practice either diagnosed on the basis of information given (5.2.1) or outlined further information they might need and how they would get it (5.2.2). The discussions of library improvement focused on policy implementation (5.3.1, the largest category), the library collection (5.3.2), organization and procedures (5.3.3), the location and appearance (5.3.4), or the image of the library (5.3.5).

Statements concerning the staff were categorized into four larger areas: gaining entry as a new principal (6.1), building trust and avoiding conflict (6.2), running a successful staff meeting (6.3), and, the largest, staff development (6.4). The entry issues were either diagnosing the difficulties the principal in the case caused him or herself (6.1.1) or outlining how to get to know people better (6.1.2), both personally and professionally. The discussions of trust and conflict were either comments on the importance of the issue (6.2.1) or specific strategies for practice (6.2.2). Discussion of meeting strategies

were either explanations of what went wrong in the case (6.3.1) or strategies for doing a better job (6.3.2). The largest personnel category, staff development, fell into five sub-categories: team building (6.4.1), leadership development (6.4.2), causing change (6.4.3), dealing with Miss Green, the case study character who had the blow-up with the librarian (6.4.4), and the problem of older, entrenched teachers (6.4.5).

The last section of the schema dealt with the librarian herself, Miss McDonald (7), and was divided into four major sections, diagnosis of the problem (7.1), further data collection (7.2), dealing with her request for a transfer (7.3), and supporting her towards improvement (7.4). The diagnoses were positive or neutral (7.1.1), negative (7.1.2), or concerned with the possible causes of her request for a transfer (7.1.3). Further data collection involved asking her about her personal feelings (7.2.1) or her plans for the library (7.2.2). Some decided they would ask others about her (7.2.3), and others felt they wanted to observe her in action or examine her files (7.2.4). The responses to her request to transfer were to get her out for her own good (7.3.1), to remove her for the good of the school (7.3.2), or to remove her only after possible remediation had failed (7.3.3). The discussion of support fell into four categories: personal support and confidence building (7.4.1), help with interpersonal skills (7.4.2), improvement of library skills (7.4.3), and development of her leadership potential (7.4.4).

The schema, as developed, has five levels of substructure. This seems close to the workable maximum, but yet, in examining specifics, the need for further detail continually arises. This difficulty led to the use of rating scales within the categories, reported next.

The Role of Experience

Three kinds of information are presented in Table 1. First, Table 1 includes a breakdown of the numbers of statements made and their ratings in the seven global areas. Each block of the table contains the numbers of statements given each rating within each experience group. Second, across the bottom of each of these blocks appear, in brackets for visual clarity, the percentages of the total discussion that focused on each of these topics. Third, below the table are summarized the results of analyses of variance done within each schema category across experience levels, using alpha = 0.01 for each ANOVA to produce an experiment-wise risk of Type I error of 0.08. Note that the percentages are derived from totals across rating levels, and thus ignore the ratings themselves. In contrast, the analyses of variance treated the ratings as the dependent variable, and the total number of ratings as the "N" for each test. Thus, the percentages reflect quantity, and the ANOVA quality of statements made.

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Insert Table 1 about here

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As can be seen, more than 90% of the discussion either dealt with the process of handling problems, or took place within the specifics of the staff, library, and librarian. There was very little mention of the role of the community or school district, or even of the broader school context. The focus of much of the responses to the case was very specific. The category on the problem solving process itself (#1) is as popular as it is probably because, as one subject put it, he knew that was why he had been invited. In addition, we also probed specifically for recall, and many of the statements made about problem solving were in this context. In the absence of our probing, most of the

subjects would have dealt, we suspect, with only the narrow context immediately surrounding the specific issues raised by the case.

Looking at the percentages across the experience levels, what is most remarkable is the absence of really substantial trends related to experience. The clearest trends are for the more experienced respondents to spend a bit less time talking about the library and the librarian, and a bit more time on the staff and on the process of problem solving. In some contrast, the analysis of variance reveals that the quality of response from the Entrants is generally poorer than from those with classroom and administrative experience.

As can be seen from, for example, the four entries in the bottom right hand corner of Table 1, typical responses are categorized roughly as 20%, 50%, 25%, and 5% at each of the four rating levels. In four of the eight sections of the table, the seven large topics plus the total, there are significant differences in overall quality of response. In each of these four sections, the Entrants exhibit lower quality responses than some of the groups with administrative experience, but do not differ significantly from the Aspirants, who have classroom experience only.

Detailed analysis across experience groups for individual schema categories was carried out by first eliminating from consideration the 19 categories with fewer than six responses and insufficient degrees of freedom for any test statistic. Second, another ten categories with six or seven responses (one or two degrees of freedom) were also eliminated, as these tests cannot produce statistically significant differences no matter how bunched these responses might be. For example, for df = 2, a difference of about 45 in group totals is required for a significant difference between groups, but even if all seven responses were coded "4" and were by individuals in the same experience group, the largest

possible group total difference would be 28. Elimination of these categories leaves only 63, and the individual comparison alpha required for a two-tailed test with 5% in each tail is 1.00 - .05/630 = .9999207.

Table 2 contains the results of Dunn multiple comparisons within these 63 categories. Categories showing no significant differences have been removed, revealing significant differences between experience groups in 22 of the categories. The cutoff scores vary with degrees of freedom, or the number of non-zero ratings within each category.

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Insert Table 2 about here

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Hardly any of the differences between groups in Table 2 have a simple monotonic relationship with experience, although if we adopt a flexible stance as to what constitutes a trend (by declaring one of the groups as an outlier), some generalizations are possible.

Within the Problem Solving categories of the schema, there is a tendency for those with more experience to recognize the complexity of the problem, to delegate to their staff more and, naturally enough, to reflect upon and relate their experience. The trend under #3, The System, can be traced directly to the difference between having a classroom teacher perspective and developing a more global view. Within the Library categories, there is a trend for those with less experience to be more accusatory toward Miss McDonald, which is somewhat contradictory to the tendency for less experienced people to recognize the need for further information on her performance. Two very clear trends, however, are for those with more experience to be unwilling to impose a solution on the staff, and to recognize that Miss McDonald will be more forthcoming in a one-on-one

situation than at a staff meeting.

A clear trend with experience, noticeable in the first three categories listed under #6, Personnel, is the development of strategies with experience. Although groups did not differ significantly in their ability to recognize staff problems, they differed quite systematically in their knowledge of what might be done about these problems. Within this same section, we can see the failure of inexperienced people to recognize how disastrous the staff meeting in the case was. We also see little concept of team building and staff development from those with little experience. As an aside, although we did not explore it systematically, it is worth hypothesizing a difference in training between those who qualified for the principalship ten or more years ago, and those who have been trained quite recently. The trends in the last section of Table 2, on Miss McDonald herself, seem the most variable with experience. However, it is clear that those with experience recognize the need to boost her self-esteem.

The literature is clear that there is no simple relationship between experience and expertise, so the equivocal nature of some of the results in Table 2 is not surprising. With this context, we turn to the examination of expertise.

The Role of Expertise

As part of the project, three professors of educational administration were given summaries of the transcripts of all but the Entrants and asked to rate each performance on a 10-point scale. The summaries were in the respondents' own words, but gave only the actions taken and immediately surrounding text. Only summaries were provided due to the length of the transcripts; even with the actual reading of the case study text removed, the 31 responses run to some 200 single-spaced pages. Based on these mean ratings, the five lowest scoring and five highest scoring subjects were selected. The lowest scoring were three

Rookies and two Veterans, while the highest scoring were two Rookies and three Seasoned principals.

Table 3 contains a summary of the results comparing these two groups of five subjects judged to have responded at high and low levels of expertise. First, as can be seen by the raw totals in the bottom section of the table, the high group had about 50% more statements than the low (ignoring statement ratings). However, as judged by the percentages assigned to each of the main sections of the schema, the relative emphasis of the two groups was largely comparable. The largest difference in emphasis was in section #6, Personnel. When the ratings are taken into account and analysis of variance performed, the two groups differed significantly in the quality of what was said for the Library section, #5, and for the overall total. One interesting anomaly in the data occurs in the Personnel section: although the difference was not statistically significant, the low-rated group actually provided more higher quality statements, rated 3 and 4, than the high-rated group. This suggests that attention, even quality attention, to general personnel issues of entry, rapport, conflict resolution, and staff development and supervision were not highly regarded by the panel of experts.

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Insert Table 3 about here

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Table 4 shows the differences between the high-rated and low-rated groups in the detailed categories of the schema. Unfortunately, due to the small group sizes, the Dunn multiple comparison technique (Marascuilo and Serlin, 1988) used to produce the results of Table 2 will produce only one or two significant differences, even if the probability of Type I error is allowed to rise to 20%.

To get around this problem, and with the goal of being able to compare differences related to expertise with those related to experience, we increased the value of the difference required between the two group totals before judging that difference "reportable" until we had achieved a number of differences across expertise comparable to that across experience (19 in Table 4 compared to 22 in Table 2). As it happened, this ad hoc cutoff score for Table 4 is 6, which is quite commensurate with those found in Table 2, considering the differences in group size between the two tables.

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Insert Table 4 about here

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With only two groups to compare, all the differences in Table 4, unlike Table 2, give the (possibly dangerous) appearance of being clearly interpretable. Some interesting differences appear in section 1 of the schema. Those rated highly tended to engage in group planning, as opposed to the counterpart category, 1.2.1.1, which dealt with needing time to reflect in private. While those scoring well talked about the role of experience in their deliberations, those scoring poorly tended to dwell on specific "war stories" from their past. Other characteristics of quality problem solving include recognizing the need for more data, and attacking major issues in bits and pieces.

In the broader context, high scorers were attuned to the usefulness of district level assistance, and recognized the link between the case study problem and issues of the general atmosphere in the school. With respect to the library, they clearly announced to staff their own expectations for its operation, they recognized that Miss McDonald's input was important, and that she ought to be asked her views in private. They also recognized that improvement of the library

collection was required, and that they again required further information on the present situation.

Interestingly, within the Personnel section are two categories on which the low scoring group put more emphasis: discussing strategies for conflict resolution, and encouraging staff change. It may be that, in the view of the panel of judges, these topics were considered digressions from the central issue. Topics which show trends in the expected direction include running an effective meeting, collecting more data (again), and having patience with the rate of change. Within the last section, the Librarian, three strong trends appear, all related to giving the problem back to Miss McDonald, and increasing her self-confidence and responsibility for herself.

Expertise and Experience

Finally, we can compare the differences between inexperienced and experienced principals with the differences between high rated and low rated responses. Remembering that three of the five highly rated responses came from the more experienced (Seasoned) principals, both these groups shared several features: they tended to reflect on experience, rely on outside resource people, recognize the need to get further data, increase library holdings, work with Miss McDonald privately, and attempt to increase her self-confidence and ownership of the problem.

Discussion

This report has examined the potential of schema analysis for distinguishing between responses to a case study presenting an ill-structured problem. Earlier work (Nagy, 1990) had uncovered limits to the ability of an hierarchical category system alone to capture the detail of response in such

complex situations. Because of this, the analysis reported here incorporated a rating scale, used within the schema system, and based on the quality of the analysis offered rather than the topics touched upon. It is significant that, with the addition of these ratings, the conclusions drawn in terms of the commonalities across Tables 2 and 4 are quite different from the analysis in Nagy (1990).

This present analysis appears clearly successful. The collective schema approach to protocol analysis is manageable, even with very large data sets and very complex problems. The results show interpretable differences between inexperienced and experienced principals. As well, they can be related in a sensible manner to independent judgments of response quality. Further, it has been possible to identify elements of expertise which are related to experience as well as others which are not.

Several issues arise from this analysis. First, it is necessary to ask what such a detailed and complex analysis provides with respect to understanding of the principalship that a less detailed and non-hierarchical classification system might not. At the least, the analysis has proven useful in dissecting the complexity of the case study in a systematic manner. Beyond that, however, it has provided a type of "territorial map" of issues facing the principal, a map which might be expanded relatively easily by examination of similar data obtained from responses to other carefully constructed case studies. The advantage of this is not only that results might be compared, but also that such work is made vastly easier and less expensive through the use of such a tool. Certainly the degree of agreement between the data coders is as high as this type of analysis in such a complex area is likely to achieve.

Second, we need to consider the implications of such analysis beyond school

administration, examining the broader issue of ill-structured problem solving. This approach has potential for student assessment in subject areas where ill-structured problems are encountered, such as any of the social sciences. Systematic research on how teachers grade is thin, but there is some evidence (for example, Nagy, Evans and Robinson, 1988) that quality of argumentation takes second place to recall of facts and to writing style and skill.

Third, this research needs to be placed in the context of other approaches to ill-structured problem analysis. Lawrence (1988) examined magistrates' thought processes in sentencing, using as her data base three magistrates dealing with three cases. Voss, Greene, Post & Penner (1983), investigated how subjects would deal with the lack of productivity of the Soviet agricultural system, categorizing statements as pertaining to goals or reasoning, using fewer than 20 subjects. Relying heavily on this earlier work, the present study has moved to considerably larger sample sizes and some hint of quantification while maintaining what appear to be roughly comparable levels of detail and research costs.

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Appendix A

Miss McDonald -- A Case Study

Please assume the role of Pat Jones in the following case. Please read out loud and verbalize your thoughts as you go, then continue thinking out loud until you have gone as far as you feel you reasonably can in handling this problem.

Sugar Maple P.S. is an eighteen room elementary school (grades JK - 8) located in a lower-middle class area of a small city. The building is rather old; it was built as a high school and was remodelled extensively to accommodate the elementary school. Pat Jones was appointed principal in August and during the first few days in the school, before opening in September, Pat visited the library, which is located upstairs at one end of the building. Pat noticed that not only were the library quarters quite small but there appeared to be few modern or new books likely to meet the interests of the older students. During the first week of school Pat suggested to Miss MacDonald, the school teacher-librarian, that she drop into the office to talk about the library.

Before the meeting Pat Jones had time to check into some of Miss MacDonald's background and found that she was starting her fifteenth year as school librarian; there were instances of personality clashes with other teachers; the grade 7 teacher said that her students did not use the library as there were few suitable books; the part-time secretary assigned to the library no longer worked there since a "blow-up" had occurred over whether or not she should erase pencil marks from the books; and toward the end of the previous year, Miss MacDonald had requested to be transferred from the library to a classroom in another school.

When Miss MacDonald came in for their meeting, Pat Jones told her that she had not received her transfer because she had submitted her request too late, but that if she made her request earlier this year there might be a good chance that it would be granted. Pat's philosophy is that professionals should be free "to run their own show", and that Miss MacDonald should feel that she had a free hand. Pat expressed the hope, however, that the library would operate for the benefit of staff and students with students encouraged to use the library for individual research projects. Miss MacDonald was highly nervous and restless; her sole comment was that her main problem was the large number of books stolen each year. Pat Jones suggested that possibly she would like to use part of the next staff meeting to discuss with the staff ways in which the library could be used. Miss MacDonald remarked that she did not like talking at staff meetings and, as she backed out of the office, she mentioned that she would send out a form on which teachers could indicate their preference for their scheduled library periods.

Two weeks later, Miss Green, a first year teacher with a grade seven class, complained to Pat Jones that Miss MacDonald had told her not to leave her children unattended in the library. Miss Green felt that this was unfair because Miss MacDonald was telling other teachers when they came to library period, "to take a prep period and have coffee." She felt she needed extra preparation time as much as anybody. Pat Jones told Miss Green that library periods were not intended for teacher preparation periods; the school had a Partners in Action

program in place, and classroom teachers were supposed to be working together with the librarian to plan the use of the library resources as part of the total program. Miss Green looked a little sheepish, but left the office obviously dissatisfied. Pat Jones was concerned that the library problem was bigger than it originally looked, and determined to do something about it immediately.

At the next staff meeting, Pat Jones introduced the topic of the library. Several teachers, apparently representing the majority, declared that there was nothing wrong with the library or the way it had always operated. A few felt that, although they valued the scheduled library periods, they would appreciate more freedom to send individuals and small groups to the library for special projects and assignments. Miss MacDonald expressed concern about who would supervise these students and went on, in an obviously emotional state, to express her belief that there should be more co-operative projects between teachers and librarian; she felt that staff members were not making use of her services; sometimes she felt she was not earning her salary. Someone asked her what she meant by co-operative projects; someone else asked for examples of services she could offer to staff. Miss MacDonald, who was extremely nervous by now, was unable to answer. One of the older staff members suggested, in a friendly way, that Miss MacDonald should consider taking a leadership training course.

The meeting ended very soon thereafter, with no agreements or decisions made.

You are Pat Jones. How will you handle the situation? Please think out loud as you consider this situation and your reactions to it.

Appendix B

The Schema

1 PROBLEM SOLVING

- 1.1 Definition of the problem
  - 1.1.1 Problem has underlying issues
    - 1.1.1.1 Fault of past administration
    - 1.1.1.2 Symptom of communication or morale
  - 1.1.2 There may not be a problem. Is this better left alone?
  - 1.1.3 No or poor actions may have consequences
  - 1.1.4 There are several related problems
  - 1.1.5 Problem confined to library or personnel-within-library
- 1.2 Problem solving process
  - 1.2.1 Planning
    - 1.2.1.1 Need for perspective, time, visualization (alone)
    - 1.2.1.2 Brainstorming, evolution of plans (group)
  - 1.2.2 Role of Experience
    - 1.2.2.1 Reflections on role of experience (not specific incidents
    - 1.2.2.2 Specific incident from past
  - 1.2.3 Role of Data
    - 1.2.3.1 Specific data collection strategies
    - 1.2.3.2 Recognition that data is required
  - 1.2.4 Problem Elements
    - 1.2.4.1 Set some priorities, action plan
    - 1.2.4.2 Identify subproblems or tackle bits
  - 1.2.5 Staff Involvement
    - 1.2.5.1 Develop ownership among staff
    - 1.2.5.2 Delegate, share with staff

2. COMMUNITY
   - 2.1 Seek community and student input to library
   - 2.2 Build community morale
   - 2.3 Investigate nature of community

3. SYSTEM
   - 3.1 Ask about board policy or procedure
   - 3.2 Consult with colleague
   - 3.3 Bring in resource

4. SCHOOL
   - 4.1. School goals
     - 4.1.1 Jointly establish school goals
     - 4.1.2 Set expectations for school
   - 4.2 Atmosphere of school
     - 4.2.1 Methods to improve
     - 4.2.2 Recognize need to examine
   - 4.3 Timetabling
     - 4.3.1 Methods to improve
     - 4.3.2 Recognize need to examine

4.4 Vice-Principal
- 4.4.1 Set expectations with/for
- 4.4.2 Get info from or use

5. THE LIBRARY

5.1 Role of the library
- 5.1.1 Comments on "own show"
  - 5.1.1.1 State disagreement with "own show"
  - 5.1.1.2 State agreement with "own show"
- 5.1.2 State Partners in Action policy (without personal endorsement)
- 5.1.3 Seek input of staff expectations
- 5.1.4 State personal expectations re library (may include reference to PIA)

5.2 Present practice
- 5.2.1 Diagnosis of present practice
  - 5.2.1.1 Problem with Miss M
  - 5.2.1.2 Problem with older staff, excluding Miss M
  - 5.2.1.3 Problem with school or administration
- 5.2.2 Recognize that data gathering on present practice is required

5.3 Improvement
- 5.3.1 Library policy implementation
  - 5.3.1.1 Initiate demonstrations and provide examples
  - 5.3.1.2 Scheduling and compromise on use
    - 5.3.1.2.1 Imposed on staff
    - 5.3.1.2.2 Negotiated with staff
  - 5.3.1.3 Staff professional development
    - 5.3.1.3.1 Principal owned and directed
    - 5.3.1.3.2 Staff owned
  - 5.3.1.4 Miss M's plans and ideas for library
    - 5.3.1.4.1 Required her to present to staff
    - 5.3.1.4.2 Request that she present to principal
  - 5.3.1.5 Active principal leadership in library improvement
- 5.3.2 Holdings
  - 5.3.2.1 Discuss inventory, culling, budget history
  - 5.3.2.2 Increase holdings
  - 5.3.2.3 Tie increase to needs of program or interests of students
- 5.3.3 Organization
  - 5.3.3.1 Theft
    - 5.3.3.1.1 Discuss only
    - 5.3.3.1.2 Improve procedures
  - 5.3.3.2 Get secretarial/volunteer assistance
- 5.3.4 Location and appearance, school plant
  - 5.3.4.1 Noting and discussing
  - 5.3.4.2 Changing
- 5.3.5 Image improvement by various means

6. PERSONNEL

- 6.1 Entry, data gathering and rapport
  - 6.1.1 Diagnosis
    - 6.1.1.1 problem with lateness of own appointment to job
    - 6.1.1.2 unfamiliarity with staff will be an issue
  - 6.1.2 Strategies
    - 6.1.2.1 For familiarizing self with staff at a personal level
    - 6.1.2.2 For interviewing staff at a professional level

- 6.2 Resolution of conflict, building of trust
  - 6.2.1 Recognizing importance
  - 6.2.2 Outlining strategies for improvement

- 6.3 Staff meetings
  - 6.3.1 Diagnosis
    - 6.3.1.1 Poor move to put Miss M on the spot
    - 6.3.1.2 Bad meeting in general
  - 6.3.2 Strategies for an effective meeting
    - 6.3.2.1 Plan, have data
    - 6.3.2.2 Other

- 6.4 Staff development and supervision
  - 6.4.1 Team building
  - 6.4.2 Leadership development within staff, excluding Miss M
  - 6.4.3 Change
    - 6.4.3.1 Comments that it takes time
    - 6.4.3.2 Encourage
    - 6.4.3.3 Build from key staff
  - 6.4.4 Miss G
    - 6.4.4.1 Neutral and positive diagnoses
    - 6.4.4.2 Negative diagnoses
    - 6.4.4.3 Recognition that further data is required
  - 6.4.5 Entrenched teachers (incl. Miss M when appropriate)
    - 6.4.5.1 Diagnoses
    - 6.4.5.2 Strategies
      - 6.4.5.2.1 Develop
      - 6.4.5.2.2 Move

7 MISS MCDONALD

- 7.1 Diagnosis
  - 7.1.1 Neutral or positive
  - 7.1.2 Negative
  - 7.1.3 Transfer request
- 7.2 Data collection
  - 7.2.1 Feelings & perceptions from Miss M (on problem, not library)
  - 7.2.2 Data collection on Miss M from others
  - 7.2.3 Data collection on Miss M from own observations and files
- 7.3 Transfer resolution
  - 7.3.1 Transfer soon for supportive reasons
  - 7.3.2 Transfer soon for program reasons
  - 7.3.3 Transfer only after attempts at remediation
- 7.4 Support
  - 7.4.1 Increase her happiness and confidence
    - 7.4.1.1 From self
    - 7.4.1.2 From others
  - 7.4.2 Group and interpersonal skills
    - 7.4.2.1 Diagnosis of group and interpersonal skills
    - 7.4.2.2 Strategies for increasing group and interpersonal skills
  - 7.4.3 Increase her library skills
  - 7.4.4 Leadership development, ownership

Table 1
Numbers of Statements by Rating and Experience Level

Schema Category	Rating	Entrants	Aspirants	Rookies	Seasoned	Veterans	Total
		Experience Level					
1. Problem Solving	1	18	8	15	4	12	57
	2	33	25	25	25	16	124
	3	4	10	9	11	12	46
	4	1	4	4	6	9	24
	(%)	(21)	(21)	(23)	(22)	(25)	
2. Community	1	0	0	0	0	1	1
	2	4	3	2	1	3	13
	3	0	2	0	1	1	4
	4	0	1	0	0	0	1
	(%)	(1)	(3)	(1)	(1)	(3)	
3. System	1	1	1	1	1	3	7
	2	3	2	4	4	1	14
	3	1	0	2	2	0	5
	4	0	0	0	0	0	0
	(%)	(2)	(1)	(3)	(3)	(2)	
4. School	1	2	4	1	0	1	8
	2	2	4	9	6	5	26
	3	0	2	0	4	0	6
	4	0	0	0	1	1	2
	(%)	(1)	(4)	(4)	(5)	(4)	
5. Library	1	21	10	10	5	10	56
	2	47	33	23	25	19	147
	3	17	16	21	19	17	90
	4	1	7	6	6	4	24
	(%)	(32)	(29)	(26)	(26)	(26)	
6. Personnel	1	16	10	12	6	11	55
	2	29	25	21	29	14	118
	3	7	11	14	12	18	62
	4	0	5	5	2	5	17
	(%)	(19)	(22)	(23)	(25)	(22)	
7. Librarian	1	14	7	10	7	6	44
	2	38	20	20	22	16	116
	3	10	15	12	11	8	56
	4	1	2	5	2	1	11
	(%)	(23)	(19)	(20)	(20)	(16)	
All	1	72	40	49	23	44	228
	2	156	112	104	112	73	557
	3	39	56	58	60	57	270
	4	3	19	20	17	20	79

Categories 2, 3, 4, 7, nsd between Groups; Category 1, #1 < #4 & #5; Category 5, #1 < #3 & #4; Category 6, #1 < #5; Totals, Group 1 < all others.

Table 2

Schema Categories With Significant Differences Between Experience Groups

Category	Experience Group Rounded Totals[1]					Rounded Cutoff[2]
	Ent	Asp	Rook	Seas	Vet	
1. Problem Solving						
1.1.4 Several related problems	2-	3	7	9+	1-	7
1.2.2.1 Reflections on experience	3-	4-	4-	19+	12+	8
1.2.2.2 Specific past incident	0-	4	3-	11+	11+	7
1.2.5.2 Delegate, share with staff	6	7	2-	7	11+	8
3. System						
3.3 Bring in resource person	0-	2	8+	8+	4	8
5. Library						
5.2.1.1 Problem is with Miss M	9	9+	5	4	2-	7
5.2.2 Need data on present practice	11	14+	8	13+	3	9
5.3.1.2.1 Impose compromise	14+	3-	8	4-	4-	7
5.3.1.4.2 Miss M's ideas in private	7-	7-	7-	16+	12	9
5.3.2.2 Increase library holdings	6	6	2-	12+	5	7
6. Personnel						
6.1.2.1 Strategy for befriending	2-	4-	2-	12+	7	7
6.1.2.2 Strategy for interviewing	11	15	8-	7-	18+	10
6.2.2 Strategy for conflict resol.	7	4-	4-	12+	5	7
6.3.1.2 Diagnose poor meeting	2-	5	11+	8	5	7
6.4.1 Team building	2-	3-	11+	6	5	7
6.4.3.3 Build on key staff	0-	12+	2-	9+	15+	7
6.4.4.3 Require more data on Miss G	2	8+	3	9+	0-	7
7. Librarian						
7.2.3 Observe & get file data	11	8	5-	13+	3-	8
7.3.1 Transfer soon for own good	8+	1-	7	7	7	7
7.4.1.1 Boost confidence personally	2-	12+	11+	12+	9	8
7.4.3 Increase M's library skill	3-	11+	6	5	3-	7
7.4.4 Develop, give ownership	2-	5	5	9+	0-	7

[1]Plus and minus signs indicate significant differences using a Dunn multiple comparison procedure with experiment-wise alpha = 0.10. Group totals have been adjusted to equal group size for ease of calculation, and rounded for visual clarity.

[2]Cutoff score is the minimum value by which group totals must difer for significance using the Dunn test. It reflects alpha, t^{Dunn}, the number of subjects with statements in each category, and the standard error of the difference between totals.

Table 3
Numbers of Statements by Expertise Level

Schema Category	Rating	Expertise Level: Low	Expertise Level: High
1. Problem Solving	1	6	3
	2	8	17
	3	5	9
	4	4	5
	(%)	(21)	(22)
2. Community	1	0	0
	2	1	1
	3	0	1
	4	0	0
	(%)	(1)	(1)
3. System	1	2	0
	2	0	4
	3	0	1
	4	0	0
	(%)	(2)	(3)
4. School	1	1	0
	2	1	5
	3	0	1
	4	0	1
	(%)	(2)	(4)
5. Library[1]	1	8	5
	2	12	14
	3	6	16
	4	1	8
	(%)	(25)	(27)
6. Personnel	1	9	2
	2	5	21
	3	9	9
	4	6	2
	(%)	(27)	(21)
7. Librarian[2]	1	7	4
	2	12	16
	3	3	8
	4	1	4
	(%)	(21)	(20)
Total[1]	1	33	14
	2	39	78
	3	23	45
	4	12	20

[1]significantly different, $p < .005$
[2]significantly different, $p < .05$

Table 4

Schema Categories with Substantial Differences between Expertise Groups

Category	Low-Rated Group	High-Rated Group	Difference
1. Problem Solving			
1.2.1.2 Brainstorming, group planning	0	6	6
1.2.2.1 Reflections on experience	5	11	6
1.2.2.2 Specific past incident	6	0	-6
1.2.3.2 Recognize that data is required	5	13	8
1.2.4.2 Attack subproblems	7	15	8
3. System			
3.3 Bring in resource person	1	7	6
4. School			
4.2.1 methods to improve atmosphere	0	7	7
5. Library			
5.1.4 State personal expectations	4	12	8
5.2.2 Need data on present practice	0	8	8
5.3.1.4.2 Miss M's ideas in private	2	12	10
5.3.2.2 Increase library holdings	1	9	8
6. Personnel			
6.2.2 Strategy for conflict resol.	8	2	-6
6.3.2.2 Strategy for running meeting	0	6	6
6.4.3.1 Note that change takes time	1	9	8
6.4.3.2 Encourage change	9	0	-9
6.4.4.3 Require more data on Miss G	0	6	6
7. Librarian			
7.3.3 Transfer only after trying to help	0	12	12
7.4.1.1 Boost confidence personally	2	11	9
7.4.4 Develop, give ownership	1	9	8